

Appendix G2

Initial Vapor Intrusion Screen for Integrys MGP Sites

(Prepared for the South Station Former MGP Site, 2010)

An initial vapor intrusion screening assessment was performed for the MGP-related constituents being evaluated at the Integrys MGP sites. This list of MGP-related constituents under consideration is presented in the Risk Assessment Framework (Exponent 2007), and in the attached Table G2-1. This initial screening followed the general approach of the Tier 1/Question 1 screening process presented in Table 1 of the *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (U.S. EPA 2002). This process evaluates whether a compound is both: 1) sufficiently volatile to result in potentially significant vapor intrusion and 2) sufficiently toxic to result in potentially unacceptable indoor air inhalation risks. If the compound fails either criterion, it is not considered further for this pathway.

Within the subsurface vapor intrusion guidance, the single factor used to determine volatility was whether a compound had a Henry's Law constant of 1×10^{-5} atm-m³/mole or greater (U.S. EPA 2002). The more current approach used by EPA for determining volatility from a risk assessment perspective is presented in the Regional Screening Level (RSL) technical document (U.S. EPA 2009). For the RSLs, two factors are used to determine volatility of a compound: that a compound have a Henry's Law constant of 1×10^{-5} atm-m³/mole or greater in addition to having a molecular weight less than 200 g/mole. This classification of a whether or not a compound was sufficiently volatile was the first criterion used in this assessment to characterize the MGP-related compounds (Table G2-1). Most MGP-related constituents are not sufficiently volatile to require evaluation for the vapor intrusion pathway.

For those MGP-related compounds that are sufficiently volatile, the second criteria of inhalation toxicity was considered (i.e., is the compound sufficiently toxic). In the 2002 subsurface vapor intrusion guidance, EPA first determined the maximum pure component vapor phase concentration of each volatile compound, and then determined if that maximum concentration would result in human health risks above acceptable risk-based targets (cancer risk of 1×10^{-6} or hazard quotient of 1). For this assessment, sufficiently toxic was defined more simply by the presence of an inhalation toxicity value in a source currently recognized by EPA (as presented in the RSL technical guidance document, U.S. EPA 2009). This simplified approach to determining sufficient toxicity is potentially more conservative (i.e., it could screen in more compounds than the 2002 EPA approach). If a compound was found to be both sufficiently volatile and sufficiently toxic, then it was determined to be a compound of potential concern (COPC) for the vapor intrusion pathway. For compounds determined to be COPCs through this vapor intrusion screening process, measures of applicable media (i.e., soil gas or indoor air) would be required if the compound is detected at an MGP site in soil or groundwater within close proximity (within 100 feet) of buildings. This initial screening resulted in a short list of COPCs for the vapor intrusion pathway: benzene, toluene, ethylbenzene, xylenes (BTEX), 1,2,4-trimethylbenzene, and naphthalene (Table G2-1).

References

U.S. EPA. 2002. OSWER draft guidance for evaluating the vapor intrusion to indoor air pathway from groundwater and soils (subsurface vapor intrusion guidance). EPA530-F-02-052. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 2009. Regional screening levels for chemical contaminants at Superfund sites. Available at: www.epa.gov/region/superfund/prg/index.html. Updated December 2009. Accessed April 27, 2010. U.S. Environmental Protection Agency, Regions 3, 6, and 9.

**Table G2-1. MGP-related compounds of potential concern:
Step 1 screening assessment for vapor intrusion**

Project Compound List	Criterion 1: Sufficiently Volatile	Criterion 2: Sufficiently Toxic	Vapor Intrusion COPC
PVOCs			
Benzene	YES	YES	X
Ethylbenzene	YES	YES	X
Toluene	YES	YES	X
Xylenes (total)	YES	YES	X
1,2,4-Trimethylbenzene	YES	YES	X
1,3,5-Trimethylbenzene	YES	NA	
Semivolatile Organic Compounds			
PAHs			
Acenaphthene	YES	NA	
Acenaphthylene	YES ^a	NA	
Anthracene	YES	NA	
Benzo[a]anthracene	NO	--	
Benzo[b]fluoranthene	NO	--	
Benzo[k]fluoranthene	NO	--	
Benzo[a]pyrene	NO	--	
Benzo[g,h,i]perylene	NO ^b	--	
Chrysene	NO	--	
Dibenz[a,h]anthracene	NO	--	
Fluoranthene	NO	--	
Fluorene	YES	NA	
Indeno[1,2,3-cd]pyrene	NO	--	
Naphthalene	YES	YES	X
Phenanthrene	YES ^c	NA	
Pyrene	YES	NA	
2-Methylnaphthalene	YES	NA	
Phenols			
2,4-Dimethylphenol	NO	--	
2-Methylphenol	NO	--	
4-Methylphenol	NO	--	
Phenol	NO	--	
Inorganics			
Aluminum	NO	--	
Antimony	NO	--	
Arsenic	NO	--	
Barium	NO	--	
Cadmium	NO	--	
Chromium	NO	--	
Copper	NO	--	
Cyanide	NO ^d	--	
Iron	NO	--	
Lead	NO	--	
Manganese	NO	--	
Mercury	NO ^e	--	
Nickel	NO	--	
Selenium	NO	--	
Silver	NO	--	
Vanadium	NO	--	
Zinc	NO	--	

(footnote on following page)

Table 1. (cont.)

--	– Compound not sufficiently volatile so criterion 2 not considered.
NA	– Inhalation toxicity value not currently available from EPA-approved source.
COPC	– compound of potential concern
PAH	– polynuclear aromatic hydrocarbon
PVOC	– petroleum volatile organic compound

Criteria 1: Sufficiently volatile. The determination of sufficiently volatile was updated to reflect the current two-pronged approach reflected in the Regional Screening Level (RSL) technical document, which considers a compound volatile if it has a Henry's Law constant of 1×10^{-5} atm-m³/mole or greater and has a molecular weight less than 200 g/mole.

Criteria 2: Sufficiently toxic. This criterion is considered only if the compound is sufficiently volatile. A compound is considered to be sufficiently toxic if it has an inhalation toxicity value in the RSL tables (U.S. EPA 2009 [December]). If there is no inhalation toxicity value available in the RSL tables, then the compound is not considered further for this pathway, because of a lack of an EPA-recognized toxicity value that could be used in a risk assessment.

Vapor Intrusion COPC: Chemicals that meet both Criteria 1 and 2 are considered chemicals of potential concern requiring measurement in media applicable to a vapor intrusion assessment (e.g., soil gas, indoor air)

^a Acenaphthylene is not listed in the RSL table, but based on its molecular weight (152.20 g/mole) and Henry's Law constant of 1.13×10^{-5} atm-m³/mole, it is considered sufficiently volatile (source of data <http://www.speclab.com/compound/c208968.htm>).

^b Benzo[g,h,i]perylene is not listed in the RSL table, but based on its molecular weight (276.34 g/mole) and Henry's Law constant of 1.6×10^{-6} atm-m³/mole, it is not considered sufficiently volatile (source of data <http://www.speclab.com/compound/c191242.htm>).

^c Phenanthrene is not listed in the RSL table, but based on its molecular weight (178.22 g/mole) and Henry's Law constant of 2.56×10^{-5} atm-m³/mole, it is considered sufficiently volatile (source of data http://www.toronto.ca/health/pdf/cr_appendix_b_pah.pdf).

^d Cyanide in soil is expected to be present in a nonvolatile form.

^e Mercury in soil is expected to be present in a nonvolatile form, such as an inorganic salt.